

# The Influence of Slow Back Stroke Massage, Cold-compress and Warm-compress to the Level of Prostaglandin F2 $\alpha$ (PGF2 $\alpha$ ) in Primary Dysmenorrhea

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## Abstract

The cause of primary dysmenorrhea is excessive release of the hormone prostaglandin F2-alpha (PGF2 $\alpha$ ). The aim of this study was to assess the influence of SSBM, cold-compresses and warm-compresses toward the level of PGF2 $\alpha$  in primary dysmenorrhea, using Post Test Only with Control Group Design and Pretest-Posttest Control Group Design. The subjects were 76 female-student, selected by purposive sampling. NRS used to measure the pain level and ELISA used to measure PGF2 $\alpha$  levels. The data were analyzed by using Paired Sample T-Test, One-Way Anova and Kruskal-Wallis test. SSBM, cold-compresses and warm-compresses are effective to decreasing of pain level and PGF2 $\alpha$  levels in primary dysmenorrhoea.

**Keywords:** *Slow Stroke Back Massage, Cold-compresses, Warm-compresses, PGF2 $\alpha$ , menstrual pain*

## Introduction

This incidence of dysmenorrhea is 20% to 90% among reproductive women and 15% occurred among young female<sup>(1)</sup> followed with pain level around 2%-29%<sup>(2)</sup>. Primary dysmenorrhoea commonly occurred among adolescents without any pathological problems at the pelvis<sup>(3-4)</sup>. The prevalence of primary dysmenorrhea among adolescent was 55.5-90.1%<sup>(1, 5)</sup>. In Mexico, dysmenorrhea affects 65% of students' daily activities<sup>(6)</sup>.

The cause of primary dysmenorrhea is an increase in prostaglandin F2-alpha (PGF2 $\alpha$ ) production.<sup>(7)</sup> The treatment of dysmenorhea commonly used nonsteroidal anti-inflammatory drugs (NSAIDs). As we know medication consumption for long time will give some impact such as medication addictive<sup>(8-9)</sup>, diarrhea, abdominal pain, nausea<sup>(10)</sup>, kidney-complications, liver-complications, sleep-disorders<sup>(11)</sup>, digestion-problems<sup>(12)</sup>. The pharmacological treatment for dysmenorrhea was successful, but about 20-25% of the failure process<sup>(13)</sup>. The one of the traditional treatment for dysmenorrhea is Slow Stroke Back Massage (SSBM), cold-compresses and warm-compresses. SSBM reduces pain and effectively increases endorphin levels<sup>(14)</sup>. Cold-compresses reduce prostaglandins, so it will make strengthens the sensitivity of pain and other subcutaneous at the injury site by inhibiting the inflammatory process and giving analgesic<sup>(15)</sup>. The skin stimulation causes endorphin loose so it will block blocking the

transmission of pain stimulus. Skin stimulation activates the transmission of sensory A-Beta nerve fibers and decreases pain transmission C and delta-A fibers so the synaptic gate closes the transmission of pain impulse<sup>(16)</sup>. Cold-compresses and warm-compresses are stimulates to loosing the endorphin  $\beta$  levels and regulate uterine hypercontractility during menstrual pain<sup>(17)</sup>.

The results of previous studies indicated that Moxibustion consumption can reduce the levels of PGF2 $\alpha$ , OT, vWF and increase the levels of  $\beta$ -EP ( $\beta$  Endorphin)<sup>(18)</sup>. However, the influence of SSBM, Cold-compresses and Warm-compresses toward the intensity of pain and PGF2 $\alpha$  levels in Primary Dysmenorrhea have not been clearly known. The aim of this study was to analysis the effect of SSBM, Cold-compresses and Warm-compresses toward Pain Intensity and Prostaglandin F2 $\alpha$  (PGF2 $\alpha$ ) levels in Primary Dysmenorhea.

## Method

The design in this study was Post Test Only with Control Group Design and Pretest-Posttest Control Group Design. The sample was 76 female students in faculty of health science of Unipdu Jombang who experienced dysmenorrhoea, selected by purposive sampling. The samples were divided into six groups: SSBM (n=13), cold-compress (n=12), warm-compress (n=13), SSBM+cold-compresses (n=13), SSBM+warm-compresses (n=13), control (n=12). The data were collected by two istruments: NRS (Numeric Rating

Scale) to measured the pain level, ELISA to measured PGF2 $\alpha$ . Data were analyzed by Paired Sample T-Test, One-Way Anova and Kruskal-Wallis test.

**FINDINGS**

**Table 1. Intensity of menstrual pain before giving intervention**

Group	Mean	p
SSBM	6.31	0.747
Cold-compress	6.75	
Warm-compress	6.31	
SSBM+cold-compress	6.15	
SSBM+warm-compress	6.77	
Control	6.17	

One-Way Anova, Post Hoc Tamhane's test

**Table 2. The menstrual pain after giving intervention**

Group	Mean	p
SSBM	3.54	0.000
Cold-compress	2.83	
Warm-compress	2.85	
SSBM+cold-compress	2.23	
SSBM+warm-compress	3.08	
Positive-control	6.00	

One-Way Anova test, Post Hoc Tamhane's test

**Table 3. The differences of menstruation pain between before and after intervention group**

Group	Before Mean $\pm$ SD	After Mean $\pm$ SD	p
SSBM	6.31 $\pm$ 0.95	3.54 $\pm$ 0.88	0.000
Cold-compress	6.75 $\pm$ 1.29	2.83 $\pm$ 1.19	0.000
Warm-compress	6.31 $\pm$ 1.18	2.85 $\pm$ 0.89	0.000
SSBM+cold-compress	6.15 $\pm$ 1.28	2.23 $\pm$ 0.09	0.000
SSBM+warm-compress	6.77 $\pm$ 1.83	3.08 $\pm$ 1.80	0.000
Control	6.17 $\pm$ 1.40	6.00 $\pm$ 1.21	0.166

Paired Sample T-Test

**Table 4. The differences of PGF2 $\alpha$  level between intervention group and control group**

Group	Median-pg/ml	p
SSBM	132.967	0.017
Cold-compress	136.033	
Warm-compress	145.367	
SSBM+cold-compress	151.300	
SSBM+warm-compress	136.767	
Control group	156.544	

Kruskal-Wallis test, Post Hoc Mann-Whitney test.

**Discussion**

The menstrual pain level before give the interventions were moderate to severe and after give treatments the average menstrual pain level in all treatment groups was mild and in control group was moderate level. The intensity of menstrual pain in this study was addressed with some previous studies which showed that the menstrual pain level among he respondents was moderate to severe level<sup>(19-20)</sup>. Some risk factors of dysmenorhea are include the early of age menarche, the longer of menstrual periods, the higher of menstrual volume, family history of dysmenorrhea, smokers, obesity, alcohol consumption<sup>(2,21-22)</sup>, high caffeine diet<sup>(23)</sup>, and high levels of stress<sup>(24)</sup>.

The results of this study showed that the average of menstrual pain level in all intervention groups are significantly decrease between pre-test and post-test. This showed that SSBM, cold-compresses and warm-compresses, SSBM+cold-compresses, SSBM+warm-compresses are effective to reduce the menstrual pain level. These interventions are cutaneous stimulation techniques, where the mechanism of these interventions in reducing pain level was explained according to the gate control theory. Gate control theory explained that skin stimulation can activate the transmission of the fibers of A-Beta nerve sensory<sup>(25)</sup>. This process can reduce pain transmission through small diameter of C and delta-A fibers so the synaptic gate will closes the transmission of pain impulse. Generally, the cutaneous stimulation on the body is on the back and shoulders. Cutaneous stimulation are influenced peripheral fibers to send the impulses by using dorsal horn in the spinal cord, when the impulses carried by A-Beta fibers are dominate so the gate mechanism will close so the pain

impulses are not delivered to the brain<sup>(26)</sup>.

The average decrease of menstrual pain level in SSBM-group. Touch and massage are the technique of sensory integration that affect the activity of nervous system. Individuals who perceived touch as a stimulation to relax, a relaxation response will appear. The use of appropriate cutaneous stimulation can reduce pain perception and muscle tension. Conversely muscle tension can increase pain perception<sup>(16)</sup>. Massage of connective tissue makes relaxes on body, reduces muscle spasms, connective tissue tenderness, increases the circulation and  $\beta$ -endorphin plasma<sup>(27)</sup>. This intervention can stimulate the autonomic nervous system to balance the sympathetic and parasympathetic nerves<sup>(28)</sup>. The SSBM was effected to reducing menstrual pain level<sup>(14)</sup>. The connective tissue manipulation (CTM) can be used as an intervention to primary dysmenorrhoea and menstrual-related symptoms because this method didn't give the potential effects such as analgesic, noninvasive and easy to do<sup>(29)</sup>.

The average of menstrual pain level in cold-compress group was ranged 6.75-2.83. The intervention of cold-compress in the abdomen for 20 minutes by using a bag filled ice. The intervention of cold-compress to respondents was helpful to reduce the pain level, this because of the blood flow was decreased in area which is compressed, and gave analgesic effect by slowing the speed of nerve delivery so the pain impulses will be decrease or less to the brain. Cold-compresses was gave the physiological effects to reduce the inflammatory response, reduce blood flow, reduce edema, and reduce local pain<sup>(30)</sup>. Cold therapy (ice compresses) intervention will be blocked and the impulses of pain will be reduce or loose for few times<sup>(26)</sup>. Previous research results showed that cold-compresses was effective reduced menstrual pain<sup>(31)</sup>.

After given of warm-compresses the average of menstrual pain significantly decreased. Warm-compresses is an intervention that can help to reduce pain by using dilated method of blood vessels so this will increasing the blood supply to the body<sup>(32)</sup>. Some previous research said that warm-compresses was effected to reduce menstrual pain level<sup>(33-34)</sup>.

In the control group after given management information about menstrual pain, a small proportion experienced a decreasing of menstrual pain level but was not significant. The information was included

pharmacological and non-pharmacological menstrual pain treatment. Non-pharmacological treatment are regular exercise, adequate rest, warm-compresses on abdomen, yoga, warm water shower, massage, deep breath, acupunctur, acupressure, TENS, salt and sugar diet, cold-compresses and deuretics consumption (asparagus and watermelon). Pharmacological treatments are hormonal-drugs and NSAIDs<sup>(35)</sup>.

The results of this study showed that there were no significant differences in PGF2 $\alpha$  levels in all intervention groups, there were significant differences in PGF2 $\alpha$  levels between intervention and control. Primary dysmenorrhoea caused by the increasing of prostaglandin production and the release of endometrial prostaglandins during menstruation so it will induce uterine hypercontractility, reduce uterine blood flow, and hypersensitive of pain<sup>(36)</sup>. Menstrual cramps more worse because PGF2 $\alpha$  was increased and PGE2 decreases, so primary dysmenorrhoea increased the ratio of PGF2 $\alpha$  to PGE2<sup>(37-38)</sup>.

Massage is a therapy to reduce the production of NF- $\kappa$ B, inflammatory cytokines and TNF- $\alpha$ <sup>(39)</sup>. Inflammatory cytokines (ex: IL1- $\beta$ , TNF- $\alpha$ ) is stimulates prostaglandin production in the first day of menstrual phase<sup>(40-41)</sup>. The results of previous studies indicated that the Swedish Massage Therapy reduced the level of Mitogen-Stimulation of IL-1 $\beta$ , IL-2, IL-4, IL-5, IL-6, IL-10, IL-13, and IFN-g<sup>(42)</sup>. The decreasing of inflammatory cytokines impacted decreasing of prostaglandin stimulation production. Therefore, the SSBM intervention can reduce prostaglandin levels in primary dysmenorrhoea.

Cold-compresses are the intervention which give vasoconstriction effects, prevented the edema, reduce inflammation, local anesthetics effect, reduce cell metabolism and increase blood viscosity. Warm-compresses are the interventions which give a vasodilation effects to blood circulation to becomes smooth and muscles relax<sup>(32)</sup>. Hot stimulation can increase blood flow in blood vessels at uterus and consequently the prostaglandin vascular will be liquid, bradykinin, and histamine<sup>(25)</sup>. Heat interventions in local area is as effective as NSAIDs<sup>(43)</sup>. The NSAIDs mechanism to relieve primary dysmenorrhea depends on the inhibition of cyclooxygenase (COX), an enzyme which responsible for the prostaglandins production (and other prostanoids). The unbalanced amount of prostaglandins from the endometrium during menstruation are major cause of dysrhythmias

contraction at the uterus, the reducing of local blood flow and the increasing of peripheral nerve sensitivity during Primary Dysmenorrhea<sup>(44)</sup>. Therefore, cold-compresses and warm-compresses are same effectively to reducing prostaglandins.

### Conclusion

SSBM, cold-compresses and warm-compresses are effectively reduced pain level and PGF<sub>2</sub> $\alpha$  levels to dysmenorrhea.

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**Conflict of Interest-** No

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